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As anticipated in our last month's issue, the price of sugar has advanced, and was quoted in New Lork May 4 at 4¾ cents. The best informed men in the trade in that city believe it will reach 5 cents, on account of increased consumption, without a corresponding increase in production.

The United States has made Spanish rule in the Philippines impossible. The world looks to the Americans to substitute a better rule for it. They cannot leave the islands to anarchy or to the concert of Europe, which would be not very much better. To abandon the Philippines now would be to plunge them again into an orgy of blood and fire.

An English paper says that at almost any retail butcher's shop in London, West End or East End, if best Canadian or any other kind of imported meat is called for, the reply will be, "Wouldn't sell it, sir; nothing but the best English in this shop." And yet in 11 months of last year they imported 527,133 head of live cattle, and 2,790,542 hundredweight of fresh beef. It wants to know if all these imports vanish into thin air as soon as landed.

Fertilizers should not be allowed to come in direct contact with the seed of any crop. This caution is constantly urged in fertilizing pamphlets and otherwise, but most of us fail to properly heed it. Careful and scientific tests have shewn that "ammonia nitrate of soda, chlorate and sulphate of potash and ammoniated superphosphates exert an injurious effect upon

the germination of seed in general." But this can be wholly avoided by mixing the fertilizer with the soil.

GONE TO HAWAII.—Mr. Leon Haubtman, of the firm of Haubtmen & Loeb, sugar machinery manufacturers and dealers, this week started for Honolulu, via San Francisco. The firm have secured some important contracts on the islands, and Mr. Haubtman goes to see to their being properly filled. Previous to his departure from this city, some friends gave a dinner party in his honor, with many good wishes for a safe journey and speedy return.—La. Sugar Pl. Journal, April 18.

The demand for molasses in the United States is very active, as very little is now turned out from sugar mills, which formerly supplied the great bulk of it. Both foreign and domestic —Puerto Rico, Cuba and Louisiana are scarce and high, and the few arrivals are eagerly snapped up by the trade who are badly in need of supplies. So great is the scarcity and so active is the competition of buyers that the market has steadily advanced and will go higher before the next crop comes in. —Ex.

The consumption of sugar in the United States has passed the 2,000,000 ton mark. At an average retail price to consumers at 5 cents per pound or $100 a ton, the domestic sugar trade represents a business of $200,000,000 a year. In ordinary seasons, more than half of this sum goes out of the country each year for imported sugar. Consumption about doubles every twenty years, and soon after 1910 it is probable that the United States will be using 3,000,000 tons of sugar per year, worth at retail $300,000,000.

A new movement seems to be started to do away with the bounty systems of European beet countries, and some pressure is being brought to bear on this subject by the government of the United Kingdom. Great Britain threatens officially to put countervailing duties on sugar from France if France persists in paying bounties on exports of sugar to the United Kingdom. Important action may be expected to be taken sooner or later relating to bounties which will change the present state of the sugar trade very materially.

The breeding grounds of mosquitoes in the neighborhood of houses may be destroyed. Ponds and marshes should be

drained. Fishless ponds should be peopled with fish, for it has been shown that various species of fish feed on mosquitoes. This latter remedy for the evil has been employed on the Continent and in America with very marked success. There is still another means at our disposal, which is within the reach of all, viz., the use of kerosene oil spread on the surface of the water on which the mosquitoes are known to breed. This has been tried experimentally in America with excellent results.

The English Government has decided to furnish its people with a telephone service, and has given the Postoffice Department a credit of $10,000,000 for its development. And why not? It is in line with government control of the mails and telegraph. If the United States can regulate the delivery of mail matter and distribute letters at a uniform rate of postage any distance, what is to hinder its sending telegraphic or telephone messages at a uniform rate, regardless of distance? It is a service for the people, by the people. It is bound to come in time, and many other reforms of similar character, especially as regards transportation and postal savings banks.

The Legislative Council at Calcutta, India, has adopted a bill imposing countervailing duty on sugars imported into India from bounty-paying countries. The production of sugar in India is very large, being mainly for local consumption, and on which the grower pays a tax. This countervailing duty will protect the domestic producer from unfair competition of bounty-fed sugars. The production of sugar in India amounts to about 1,000,000 tons, of which there is exported less than the quantity of foreign sugar imported. The exports increased greatly during the past three years. The imports increased from 14,400 tons for the campaign 1895-96 to 107,983 tons for 1897-98.

Coffee growers should not be discouraged by the present low prices. This is sound advice, and is based on conditions that are a repetition of the history of the coffee trade. Higher prices will again return, as they have in the past. In 1886 there was an era of low cost, and the industry being unprofitable, the planters neglected their plantations and no new areas were cultivated. The supply was out of relation to the world's requirements, and an era of high prices followed, and this stimulated coffee-planting in Mexico, Central and South Amer-

ica, and in time has brought out an excess of supply and present low prices. There is no excess of fine coffee, and the result is the wide range in quotations—from seven cents for low grade up to 33 cents for the finest raw Java and Kona.

THE SUGAR WAR.—The fierce competition which marks the sugar refining interest never was stronger than at present. It looks now as if the outcome of the trouble would be a complete revolution in methods of distribution. We would not be surprised if eventually refiners were forced to sell sugar direct to consumers, just as milk, soap, and other articles are now sold. The introduction of package sugar was an innovation that is still in its infancy. The two-pound paper package has ben followed by the two-pound and five-pound cotton packages, and in time the packages will be made to conform to the wants of consumers in various sections. And then we shall have the dollar package, and soft sugars, as well as hards, in packages of varying weight. And then?—Exchange.

The formation of new sugar corporations continues, and during the present month, the Olaa Sugar plantation has been organized, with a capital of $5,000,000, double the amount of stock called for having been subscribed within forty-eight hours after the lists were opened. The land is located in the districts of Olaa and Puna on Hawaii—some ten to twenty miles from Hilo—the road to the volcano passing through it. Much of this land is rocky—not plowable—and will require to be cultivated by hand, as is done by the Wainaku mill in Hilo. To produce the cane crops will require a very large number of laborers, working on shares. The Wainaku estate has, however, paid very handsome profits to its owners during the past five years, and if laborers can be had, Olaa plantation should do as well. For list of Hawaiian sugar plantations, see page 240.

BERMUDA.—The U. S. Consul writes from Bermuda, about the great fertility of that island. Out of a total of 10,642 acres, only 3,000, he says, are under cultivation. The ground often yields four crops of different vegetables within a year, but the majority of the farmers are ignorant and shiftless and fail to take advantage of the opportunities afforded by the fertility of the soil. In contrast with this general condition are the estates of the skilled planters. Upon one such estate, one acre planted in tomatoes yielded a crop worth $1,500, and

an acre of lilies brought a return of $1,800. The principal exports, which all go to the United States, are onions, tomatoes, potatoes, and lilies. The lily plant, which is the most important of all the productions of the island, is now suffering from a parasitic disease. This has not only attacked the lilies, but is also seriously affecting the crops of onions, potatoes, and other vegetables. It is receiving careful investigation, but a remedy has not yet been discovered. Bermuda formerly produced a great number of fruit trees, including the peach, pear, plum, orange, lemon, and others more tropical in their nature. The banana is the only one remaining, the others having perished through disease.

A New Sugar Combination.—A Wall street rumor connects Standard Oil interests with the movement in the stock of the American Sugar Refining Company, with a view of combining present competitive interests into one huge trust. Such a move, if consummated, would invite fresh competition of a very strong character. It would place a premium on the starting of new refineries free from the burden which an excessive stock issue imposes.

The history of the American Sugar Refining Company demonstrates the profit there is in refining sugar, and more than confirms the statement once made by the prince of sugar refiners, Theodore A. Havemeyer, that he wanted no better business than refining sugar at a net profit of one-sixteenth of a cent per pound.

Up to the recent war the trust has had an average net profit of one-third of a cent per pound. This has enabled it to pay 12 per cent. dividends on $37,500,000 common stock, 7 per cent. on $37,500,000 preferred, and put over $11,000,000 to surplus account. Since its organization it has paid in dividends over $50,000,000.

Any industry as profitable as that can never escape competition by combination on combination. The present war is, as stated by an authority in the trade, "a war of giants," and is likely to be a fight to the finish, or "the survival of the fittest."—Am. Grocer.

An Eulogy of Sugar.—"Children all over the world and all the keepers of sweetstuff shops," says Kuhlows, "ought to join in a testimonial to the learned though anonymous scientist who publishes in the Allgemeine Zeitung an enthusiastic glori-

fication of sugar. Not only as a 'genussmittel,' but much more as a 'nahrungsmittel,' sugar is almost the most valuable thing which enters the mouth of man, woman or child. There is scarcely any other equally important feeder of muscle power. The laborer can do nothing better than keep a few lumps of sugar in his pocket. The negroes in sugar plantations renew and quicken their weary bodies by sucking the sugar canes. Sugar is a fine restorative for soldiers. A Dutch army surgeon asserts that during an expedition in Sumatra he found that the best means to maintain the soldiers in vigor and freshness, not only during the march, but during the fight, was a generous allowance of sugar. Each man was served with a handful at a time. The Swiss chamois hunters bear similar evidence of its marvelous powers of sustenance and of recuperation after exhausting fatigue. The poor hardly realize as yet, or only realize unconsciously, what a treasure they possess in cheap sugar. Its value in fever has been emphasized by Hupeland and others. That which is supposed to injure the teeth in the consumption of 'goodies' is not the sugar, but the so-called 'fruit acids' which are introduced to flavor the sugar. Negroes who devour sugar in so huge a quantity have the best teeth in the world."

THAT BEET SUGAR CO.—In our issue of March 17 we mentioned the fact that "The Advanced Beet Sugar Construction Co." had opened an establishment in Boston. The parties seemed reluctant to give us detailed information, which we deemed of especial interest to the grocers and whom we supposed they would be anxious to have know all the details of their business, as it is to the retail grocers they wish to sell stock. The Retail Grocers' Advocate declares that this company "neither owns nor controls any beet sugar factories at all, nor has it any other kind of factories." It declares that "the only objects of value now in the possession of the company are the money already collected from subscribers, and certain shares in the Rome (N. Y.) sugar factory, the value of which, of course, is entirely dependent on the value of the future output of that factory." It "has no sugar, except what it may buy of existing sugar companies with the money supplied by subscribers."

"The company is capitalized at the enormous sum of $50,000,000—of which $40,000,000's worth of stock will be given away—that is, you buy one dollar's worth and get four dollars' worth given to you for nothing."

"Just for fun, let our readers figure out what the promise to pay six per cent. on $10,000,000 and 15 per cent. on $40,000,000 means. Think of a company, without capital except what is supplied by the efforts of solicitors, and with no sugar plants, promising to pay $6,600,000 in dividends each year!"—N. E. Grocer.

SELLING PINEAPPLES AT AUCTION.—A new system has been inaugurated in New York, of selling tropical fruits at auction. The New York Commercial of April 11 reports the first sale at auction of 570 barrels of Cuban pineapples. The fruit was placed under the hammer, and this first sale was disposed of at full rates, from 19 cents for fancy, with other grades ranging from 15 cents to 9 cents for each pine. This first sale realized full market quotations. The next steamship, to arrive in a few days from Cuba, had 1240 barrels of pines, all of which were to be auctioned off immediately on arrival. Fruit dealers from two hundred miles distant, attended the sale and purchased supplies. It is probable that similar sales of pineapples, oranges, bananas and other fruits will be held in San Francisco, whenever large supplies arrive. It seems to be the most satisfactory way to dispose of large quantities of fruit. Commenting on the sale in New York, the paper referred to says: "Pineapples at auction is an innovation. Cuba forwards two steamship cargoes a week. Before the war Cuba was shipping about 400,000 barrels in a season, beginning in January and lasting to July. This season her exports will probably fall short of 300,000 barrels. Each barrel averages about five dozen pines. From these statements it will be seen that the selling value of the product which may pass from the hands of private dealers to the auction men, with this short crop year, estimating the pines to average only 7 cents, run up to about $1,300,000."

One fruit dealer said: "I have always contended that certain products can be sold quicker and to better advantage at auction than at private sale, and it would not surprise me if in the near future apples are handled at auction in this city. When a movement in that direction is inaugurated others will follow, until nearly all Southern fruit produce is disposed of in that way. No one can tell where this system will finally end its usefulness in facilitating the transfer of the products of the earth."

Willett & Gray's latest statistical at hand has the following regarding the sugar market: "The long continued strength and improvement in the market is beginning to attract more attention and the question is more often asked as to when and where it will end. We confess from the very intensive view we are able through our connections to take of the sugar trade situation that we are able to see no let up to the strong position of the article for at least two campaigns, and we expect the next campaign to give better results to importers, refiners, speculators and jobbers than the present has done and will do to its close. The beet sowings can now be pretty well estimated, and are likely to be several per cent. less in increase than has been previously estimated. The regular cane crops of the world are known now and are under such a system of regular cultivation that no important increase can be expected. The irregular Cuba crop which in normal conditions plays such an important part in the direct supplies of the United States and has indirectly so important an influence on the world's supplies, can now be safely considered as promising a smaller crop the next season than even the small crop of this season. Some reasons for this are given in our Cuban correspondence.

"Against such limited supplies for another campaign, we have the very significant fact that the consumption of sugar is rapidly increasing and especially so in the United States. In this regard the so-called "Sugar War" is a great aid and abettor. The price of refined sugars as compared with raws has never been so low and every incentive has been given every handler of sugar from the refiner to the consumer to dispose and use as much of it as was possible to be used for any and all purposes. The seventy million of sugar spoons go more often to the sugar bowl under these conditions than when prices are high and likely to decline. Prices are low and likely to advance and hence everyone keeps a full supply, and a full supply means a full consumption of sugar all the time.

"Thus far since January 1st, the United States shows increased consumption of 125,000 tons over last year. All the tone and tendency is towards a continued improvement in demand, consumption and in quotations."

The latest quotation of Cuban Centrifugals of 96° test, in New York, was 4¾ cents, with a very strong market, indicating a further advance in the near future.

THE VANILLA BEAN.

This valuable product, which is highly prized for making extracts of perfumery and in cooking, has, within the past few months become very scarce, and the price, in consequence, has advanced to three times what it formerly sold for. Nothing has ever been found to take its place in cookery, or for perfumery, and consequently the price must remain high for some years to come, as it takes three years for the plant to come into bearing, after which it continues in fruit for several years, improving from year to year, if well cared for.

A recent published statement says that the shortage of 1894 was due to a frost, which destroyed whole plantations. Then in 1895 a clash between the Indians, who occupy and cultivate the large plantations around Papantla, Mexico, the centre of this industry, and the Mexican authorities, who own the lands, resulted in the former being driven out, but not before they had succeeded in almost entirely destroying the vanilla plants as revenge. These two causes account for the shortage, as it requires three or four years before a plant will yield fruit. This shortage is much greater than is generally known. The present price of beans is $16.00 per pound, and it is not unlikely that it may advance to $18 or $20.

We have several times urged the planting of vanilla as a minor industry, as it will flourish here in almost any locality, where it has plenty of water, but is particularly adapted to the rainy sections of Hawaii. Although it requires three to four years for the vines to come into full bearing, it will then pay better than almost any other industry, that does not require much capital. Nor will it interfere with any other light work, and is particularly suited to females. In a future issue we will give some particulars regarding its cultivation and mode of curing the beans.

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SUGAR CANE INDUSTRY IN MAURITIUS.

In this issue will be found an interesting article on this subject, written by a resident of that island, which is located in the Indian Ocean, off the eastern coast of South Africa, near Madagascar, and is a part of the British Empire. It has long been noted as a sugar producing country, its chief drawbacks being occasional droughts and hurricanes. It being a part of the world seldom visited by travelers, though always re-

ferred to in the lists of sugar-producing countries, the article will be read with interest by all engaged in the cultivation of cane. It furnishes a better statement of the sugar industry in that colony than any we have seen. Sugar cane was first cultivated in Mauritius 152 years ago, and for the greater part of this period, its cultivation and manufacture were of the rudest kind. Still, "Mauritius crystals" were for many years a favorite staple in the English market, where most of the crops were sold, but of late years it has gone to South Africa.

It will be noticed, on perusing the article, that seedling canes are now being cultivated for the mill, from seeds received from the West Indies, but as yet no results have been published regarding them, as compared with the favorite old canes. The names given in the article, to the old canes referred to, as cultivated there, are different from any known here or in Louisiana, though they have among them the Bourbon or Lahaina, so well-known everywhere. It will be noticed that the "borer" has been very destructive there, and that the fields suffer also from "degeneration" or "exhaustion of the soil," which simply means that fertilizers of the kind needed for its recuperation are not properly applied. Any land that has been cropped with one plant for a hundred years without being properly fed with the food required to renew its strength, must necessarily become worthless for cane, which demands rich and constant nourishment. The article is an interesting and instructive one, showing the danger of over-cropping sugar lands, and the necessity of allowing them to have a rest, and planting them with some of the valuable leguminous plants that are now used, such as cowpeas, lupines, Florida beans, etc., which are proving so beneficial to worn out lands.

The writer says: "A remarkable fact, which does not escape the planter's observation is the difference in the crops or yield from the same species of cane planted in different parts of one and the same estate. To my personal knowledge, on one estate in the south part of the island, the same species of cane has produced more sugar in higher parts of the estate than in the lower parts bordering on the sea, while another species produces more sugar in the lower region than in the higher."

Now we all know that most canes are better adapted to lowlands, where they always yield well, if well watered and cultivated; but the same varieties may not do well on highlands, where the temperature of the air and rain is lower and colder.

On the other hand, there are a few varieties, like the Rose Bamboo and the Whitney cane, of Hawaii, which flourish best on highlands, yielding good returns, but do not thrive as well on lowlands. Such has been the experience of planters here, who are very careful in the selection of seed for highlands, which often possess much richer soil than lands lower down.

We find no allusion to artesian wells, and infer that there are none on Mauritius, our inference being based on the reference to the losses occasioned by droughts. If the experiment has not already been made of boring for artesian water there, it certainly should be. That island is no smaller than some of our group, which now receive abundant supplies from this source. Without artesian water the city of Honolulu would now be compelled to distil water for its inhabitants, during the dry seasons. Fully one-half of the sugar cane now grown on these islands, may be credited to the abundant but very costly artesian supply.

Another item noticed in reading over the Mauritius article is the growing scarcity of fuel. This could be remedied in Mauritius, no doubt, as it has been on Oahu by planting the carob or algaroba tree, which is a rapid grower on any waste lowlands, and supplies a most excellent fuel, for domestic or any other purposes. Our sugar mills use very little wood for fuel, the bagasse or trash being found ample for even our largest mills.

The Mauritius article, though quite lengthy, will prove interesting reading to all engaged in cultivating cane or making sugar.

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HARBOR IMPROVEMENTS.

In the February issue of the Planter, attention was called to the necessity of enlarging the harbor and the construction of new wharves to accommodate the shipping which is rapidly on the increase, in size as well as in draft. All the new steamers, now being projected for the China and Australia routes are to be larger than any that now come here, say 7000 to 10,000 tons burthen, and drawing, when loaded, from 26 to 30 feet. This dredging work will no doubt be soon commenced by the American Government, to which it properly belongs.

The same demand for accommodations for large steamships is being made in New York, and the advantage of having larger vessels and deeper water is shown in the following extract taken from a paper published in that city:

"The projected deepening of the harbor, in which nearly 65 per cent. of the nation's imports are received, and from which nearly 40 per cent. of its exports are shipped to foreign lands, is a work affecting national rather than local interests. Since 1871 the depth of water (at low tide) in the entrance channel has been increased from 24 to 30 feet, while the maximum draught of the freight vessels entering the harbor has been increased from 21 to 32 feet. With this increase of draught the maximum carrying capacity of the ships has been enlarged from 2000 to 12,000 tons. Since 1871, and chiefly because of this increase of freight capacity, with the greater speed due to improved motive power, which the enlargement of vessels permits to be used, the average freight charges per ton by steamer between New York and Liverpool have been greatly reduced. This is shown in the following table:

	1871.	1881.	1891.	1898.
Flour	$8.40	$6.00	$3.60	$2.40
Wheat	6.32	4.80	2.40	1.92
Provisions	9.60	7.20	4.80	3.00

"This reduction has been of great value to the American farmers, who sell their products abroad in competition with those of other lands, and are benefitted whenever the cost of carrying them across the ocean is lowered. They thus gain access to markets which otherwise would be closed, and receive more for what they sell. The size, and with it the draught, of the freight steamers, is steadily increasing. There are now under construction in Europe eight vessels having a cargo capacity of 14,000 tons, with a loaded draught of 33 feet, and all designed for trade with New York. It pays to prepare for the admission of such ships. Such preparation will encourage the construction of others drawing even more water, the use of which will further reduce carrying charges. The farmers of the West, and all the people of the country, have an interest in the projected improvement. The investment of $6,500,000 in the work will be a profitable one for the nation."

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At the request of patrons of this monthly, we insert a list of Hawaiian incorporated plantations, giving such data regarding them as will be of general interest here as well as abroad. This list will be revised for each issue.

A DECISION RELATIVE TO SUGAR DUTIES.

A decision of importance to all interested in the manufacture of sugar, has recently been made in reference to the tariff rates assessed upon sugars based upon what is known as the polariscope test, under the Tariff Act of July 24, 1897. It was claimed by the importers that these duties were excessive and that the test by the polariscope should be construed as meaning the commercial polariscope test used in general trading.

The finding of the board, the opinion being written by Judge Somerville, is summarized as follows:

"The regulations of the Secretary of the Treasury of October 27, 1897, prescribing that a particular polariscope test made by special apparatus shall determine the classification of imported sugars in place of a former commercial test are not unreasonable or violative of any provision of law. It seems that the commercial test was adopted for arriving at market value rather than for the purpose of classification. The phrases 'testing by the polariscope' and 'degrees shown by the polariscope' as used in paragraph 209 of the Tariff Act of 1897, have no peculiar trade meaning, but are used descriptively in their ordinary signification as indicating a true polariscope test."

The opinion further says, in part:

"It is a matter of common knowledge, and is corroborated by the testimony in these cases, that the polariscope—an instrument for polarizing light and testing its properties—has been used to determine the percentage of pure sugar in any given sample, without regard to its color or condition. The sugar to be tested is weighed with great care and dissolved in an exact volume of water, usually contained in a flask; and a ray of polarized light is then passed through the solution. In this passage the ray is deflected in proportion to the amount of sucrose in the solution, the deviation being measured upon a scale of 100 degrees, the number of degrees indicating the percentage of pure sugar.

"In reference to the so-called commercial test, contended for as correct by the importer's counsel, the testimony taken at the hearing satisfactorily shows the following facts:

"During the time the Tariff Acts of 1883 and 1894 were in force it was the custom of merchants, in buying and selling sugar, to have two separate polariscope tests made, each by

a trade chemist employed by the respective parties to the transaction. Where these two tests differed a compromise or 'settlement' test was adopted, which was the average of degrees shown by the two tests.

"Their testimony utterly fails to show any peculiar trade meaning attaching to the phrases 'testing by the polariscope' or 'degrees shown by the polariscope,' as used in paragraph 209, of the Tariff Act of 1897. These phrases are, manifestly, used descriptively, in their ordinary signification.

"The doctrine of commercial designation, as settled by the courts, has no bearing on the subject and refers merely to the denomination of imported merchandise subject to duty under tariff legislation. The rule is that the subjects or classes of subjects described in the schedules of a tariff act are understood to be used by Congress in their special commercial or trade meanings if the trade is shown to attach to them a significance different from their meaning in ordinary speech.

"The importers' contention, then, resolves itself into this: That, in using the phrase 'testing by the polariscope,' Congress referred to a particular system which had prevailed in the trade for twenty-five years or more, used in ascertaining market values of sugars dependent on actual sales by merchants, rather than to a true polariscopic test by improved instruments and advanced scientific methods, designated to determine classification rather than market value.

"These facts are pertinent, in view of the importers' contention that the system of sugar tests under the present regulations is not so accurate as the former system, leading to erroneous results, prejudicial to their interests, and that the Secretary's regulations authorizing such system are unauthorized by law.

"Weighing all the testimony, and viewing it in every respect in which it can be legally considered, we see nothing unreasonable in the variation allowed by the regulations, based on the factor of temperature—certainly none which, in our judgment, would authorize this Board or the courts to pronounce this feature of the regulations illegal or violative of any provision of law.

"In conclusion we must note one fact of great importance as showing that under the regulations of 1897 results have been reached as to sugar tests far more accurate and uniform than any attained under previous methods. It appears that, under the old regulations and the commercial method, there

was an ascertained difference of 0.6 of one per cent., on an average, between tests made at the port of New York and those made at Boston and Philadelphia, the three chief sugar ports of the country. This was demonstrated by an exchange of tests made at the different ports, from identical samples, the experiments continuing from day to day for over six months. Under the new regulations this difference is shown to have been reduced to about 0.1 or one-sixth of what it was under the old system. This is probably due, in part, to the fact that all the apparatus used for testing sugar, including polariscopes, weights, flasks, tubes and quartz plates, are now required to be standardized and their accuracy attested by the Office of Standard Weights and Measures, U. S. Coast and Geodetic Survey, in conformity to the requirements of paragraph 77 of these regulations. Naturally, this leads to more uniform results, and is an improvement on the former practice.

"There remains but one other point to be specially considered. It is shown that, under the new regulations, chemically pure, or refined sugars, sometimes test over 100 degrees by the polariscope, reaching as much 100 and two or three-tenths in addition. Of course, the practice of customs officials is to reject all such additional readings as errors authorized to be disregarded, and this fact is urged as a demonstration of the inaccuracy of the new system. Our judgment is that, while this fact may demonstrate the want of mathematical accuracy in sugar tests, it may be satisfactorily accounted for on one or more of the following grounds:

"First. There may be errors of observation in reading the scale, which runs to fractions of degrees, and which requires great accuracy. The present regulations, accordingly, make an allowance, as stated above, of two-tenths of 1 per cent. for errors of observation, temperature, etc. The former regulations made an allowance of three-tenths of 1 per cent. 'to eliminate the possible errors of observation.'

"Second. The flask holding the solution may contain too little water and slightly too much sugar, thus making the solution more concentrated and causing too high a polarization.

"Third. The presence of traces of 'raffinose' in the sugar would account for such a result. 'Raffinose' is defined as a colorless crystalline compound, represented by the chemical formula C18 h 320 10 5h 20. The scale on the instrument, which is designed only to polarize sucrose, the essential ele-

ment of sugar, would thus indicate a higher polarization by reason of the presence of this 'raffinose.'

"In the light of the evidence taken at the hearing these explanations seem not unreasonable. It is admitted on all sides that mathematical accuracy is not attainable by any such process.

"In cases of this kind, moreover, the settled rule is that the burden of proof is not on the Government to show that the Collector's classification is correct, but the presumption is in favor of its correctness, and the burden is upon the importer to show that it is not correct. In our opinion this burden of proof has not been successfully sustained by the importers, and their protests are accordingly overruled, the Collector's decision being affirmed in each case."—N. Y. Journal Commerce.

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THE SUGAR INDUSTRY OF MAURITIUS.

By James Forrester Anderson, F.R.G.S.

Paper read at a meeting of the Royal Colonial Institute.

In presenting this Institute with a paper on the sugar industry in Mauritius, that fair isle of my birth, I will endeavor to condense the numerous heads of information with which the subject is replete, into such form as the short time of an afternoon lecture will allow, and shall do my best to make the paper as interesting as I can. I will therefore ask to be excused if I but touch lightly on statistics which, as a rule, make up the dry side of a lecture. I shall not occupy your time by introducing my native island-home to you, geographically or ethnologically. I take it for granted that most of you, if not all of you, know where "Le Malte de l'Ocean Indien," as Monsieur Theirs calls it (the Malta of the Indian Ocean) is situated. Moreover any one can gather a good deal of information about the island, now rightly designated as the 'Stella clavisque maris Indici" (the Star and Key of the Indian Sea), from the admirable paper read before this Institute by our worthy chairman, Mr. Jourdain, in April, 1882.

In speaking of the sugar industry, one is necessarily desirous to know what is that substance called sugar, and where it comes from. It is not my purpose to give you the technical definition of sugar, but I will only remind you that substance may be obtained from innumerable bodies called Carbo-

Hydrates, containing the elements Carbon, Hydrogen, and Oxygen. We have to deal in this paper with cane-sugar and no other, suffice it to say that it is the chief ingredient of the grass-plant, the sugar cane (Saccharum Spontaneum L.), from which it is extracted. We shall therefore begin by speaking of the sugar-cane in Mauritius, we shall tell of its introduction in that island, the manner in which it is planted or sown, as the case may be, and the process by which sugar is obtained from it, and finally touch upon the state of the sugar industry, past and present, in the island.

The sugar cane is said to have been introduced in Mauditius about the year 1747 by the French, from the Dutch East Indies, during the governorship of Mahe de Labourdonnais, when the islands was called "Ile de France;" it retained that name throughout the French occupation from 1721 to 1810. A usual way of planting the cane at that time was by sections of the stem (cuttings) in furrows; from a small acreage at the first, large fields were covered with it; two or three years later, about 1750, we find the first sugar factory at work, that of Mahe de la Villebague, brother of the governor, in the district of "Pamplemousses." I am not prepared to affirm that the sugar-cane, at the time of its introduction in the island, or soon after, was propagated by seeds; but I am able to state that the propagation of the sacchariferous reed from seeds became a thing of reality only in the last eight or nine years, while in Barbados, in the West Indies, our fellow-planters were ahead of us in that respect. More than one "seance" of our Royal Society of Arts and Sciences of Mauritius, some thirteen years ago, were taken up with the discussion of this question of cane-seedlings, but no practical result was arrived at by our scientists, and the matter did not germinate. In the latter part of 1889 or the commencement of 1890, an intelligent planter, Mr. Perronat, studied the question, and with seeds from the West Indies he made several experiments which produced such satisfactory results that he is reaping a fairly good harvest of rupees from his seedling-canes. These canes are very fine, and are very promising in their yield of sugar; the best yield of sugar, however, does not always depend on the beauty and stoutness of canes, there are certain species of canes which look very slim, but which give more sugar than many bigger species. For example, the "Bois-rouge" and the "Chef-Branshue," two thin and comparatively

short species, have been known to yield much more sugar than the "Lourde," a heavy, stout, and tall cane, which to my knowledge has yielded half the quantity of the two thinner canes, these last however have now disappeared, chiefly so the "Bois-rouge." Among the canes that have hitherto produced the largest crop of sugar are the "Diard" and the "Bellouguet," chiefly the latter, which in the central parts of the island, some thirty and odd years ago, on "Bonne Mere" and "Trianon" Estates gave an average yield of five and six tons of sugar per "arpent," (about 1¼ acre) but it is now a tale of the past, such kinds having disappeared by the havoc of that destructive insect, the "Borer," as well as from the degeneration due to exhaustion of the soil and the overplanting of the same stock in the same soil from year to year. When the Mauritius planter now-a-days realizes an average yield of two or two and a half tons of sugar per acre from his canes, he considers himself very fortunate, for with a lower average than two tons he would be working at a loss, considering the low market price of sugar at the present day.

The usual way of planting the cane to-day, in Mauritius, is to take two "tops" or heads of the species and place them together with a thin layer of soil over them, in short trenches ("fosses") 12 inches by 5 and 6 deep, eight inches apart from each other; these "fosses" are carried across the field leaving a space between the rows, of three or four feet. Within a week, generally the nodes or the "eyes" (as we term them locally) in each joint spring out, and when the young shoots are 12 to 14 in. high a handful of guano or chemical manure sprinkled round them speedily transforms the feeble shoots into an abundant and luxurious growth. On attaining 12 or 14 in. more above the level of the ground, a basketful (20 or 25 lbs.) of prepared stable manure, from dunghills twelve or fifteen months old, is strewn all round the plant and covered with a layer of the surrounding soil; with this double and rich nourishment a clump or "stool" of some twenty or more stems springs up under the beneficial influence of sunshine and rain. In due time the eyes of the planter are gladdened by the matured growth of the canes reaching some ten or twelve feet high and beautiful with varied tints, from which the long green ribbon-like leaves drop while the plumes of silver-grey flowers wave overhead. The "cutter" (the local term for the "reaper") then comes with his knife or bill-hook and cuts down

the canes an inch or two from the roots, to be carted to the "usine" or factory, where they are crushed by the powerful steam-rollers. The age of maturity of the cane is not alike in all the species: some canes will ripen after twelve months' virgin-growth, others after thirteen or fifteen—by virgin-growth is meant the first growth from the time of planting; the first canes of this first growth are the virgin canes. After the cutting of the virgin canes the stumps are left in the soil and made to reproduce fresh shoots by the same means of guanoing or manuring, as at first—at the time of maturity. These canes, now termed "first ratoons," are cut down and carted to the factory to be crushed by the steam-rollers.

Some species are allowed to reproduce up to the "third ratoons." Fifteen and twenty years ago "fifth ratoons" were frequently to be seen in a field, but at that time the planter was fortunate in being able to make use of a very rich Peruvian guano, the "Chinchas" (the deposit of which is now extinct), which worked wonders. On the other hand, experience, which is the best school of life "though the fees are high," has shown that with the best species it is wiser to stop with the second ratoons at the utmost, in order to obtain a remunerative result and at the same time prevent the degeneration of the species, which fact did not trouble the minds of our predecessors fifty years ago when, for instance, the fourth ratoons of the "bamboo" cane gave as much as three tons of sugar per acre, and when the soil needed not half the artificial manure it does today. The impoverishment or exhaustion of the soil may be easily understood when we find estates which have been planted annually with sugar cane for the last eighty or ninety years; hence the abundance of guano and manure which is now required to restore the vital energies of the soil. A remarkable fact which does not escape the planter's observation is the difference in the crops or yield from the same species of cane planted in different parts of one and the same estate. To my personal knowledge—on an estate in the south of the island, the same species of cane has produced more sugar in higher parts of the estate than in the lower parts bordering the sea; another species producing more sugar in the lower region than in the higher. Therefore we can easily understand how chary the Mauritius planter is concerning the varieties of the species of cane he cultivates, and specially the chemical composition of the soil in the various parts of his estate, so that he may know exactly

the nature of the guano and manure which he must use. Experience has taught him now that the greater the variety of species, the greater the result—the more abundant the yield of sugar.

In days gone by, an estate was seldom seen or heard of which had altogether more than two species throughout its plantation. These questions did not in those days claim such close attention and study from our predecessors as they do now from us, who, when able to afford it, go to the expense of a certificated agricultural chemist and of a proper laboratory for the purpose of solving such vital problems of our present day agriculture. I have heard of an estate which had only species of cane, the "canne blanche" (white cane) that gave a very good yield, but unfortunately was the first in the Island to be attacked by disease; this was about 1835 or 1840. Before this and even for some time after, the planter, with the remarkable fertility of his lands maintained by the existence of the thick wood around all the water-courses in the highlands of the country, did not find himself compelled to add to the soil two or three ounces of Peruvian guano at Rs. 160 and Rs. 180 a ton, and other costly manures, but simply basked in the sunshine of prosperity with an average yield of five tons of sugar per acre, and a market-price of 28s to 30s per cwt., leaving all "a la grace de Dieu." At that period the northern districts of "Pamplemousses" and "Riviere du Rampart" were the most fertile region for the sugar cane, but since 1860 or thereabouts, the Central and a part of the Southern districts have surpassed the North in production; this change of scene is mainly due to deforestation brought on by the eagerness of the Mauritian to cultivate the sugar-cane and nothing else to speak of, so that every acre of land was turned into a cane-field, hence the land had to be cleared of every bit of wood it happened to have on it. This yearning for the sugar cane, transmitted from generation to generation among the Mauritian families, and which has a peculiar attractiveness for the mind of the new comer, is due to the inestimable value of the sacchariferous reed, for it is undoubtedly one of the best economic plants which Providence has given to the inhabitant of the intertropical region. When the cane has reached maturity, the dry leaves, which are removed by hand from the stem, are either carted to the yard of the factory to be stored in the large sheds to serve as fuel, or are buried a foot or two deep in the space between the rows of

canes in the field in order to keep up the richness of the soil by contributing thereto the potash salts they contain, this last alternative is now being universally adopted. Another use of the dry leaves of the cane is for thatching, but this is gradually being abandoned from the fact that a large quantity is needed for the purpose, also from their being an easy prey to a single spark of fire. The green leaves of the cane which crown its top are used as forage for the mules and cattle. The top or head of the cane is the most valuable part of the plant, for without it the species cannot be propagated, and the flower today is the source of the seeds from which the species are derived. The cane itself, after being crushed by the steam rollers and reduced to a mere dry fibrous pulp called "bagasse" or "megasse" is conveyed to the furnaces as fuel, the ash of the bagasse is gathered and used as manure, the refuse from the juice after filtration, called "petite bagasse" (small cane trash) is also gathered and mixed up with the manure. The roots of the cane when dug out of the ground are often carted to the sheds to serve as fuel, or left in the field for the laborers, who use them as fuel in their huts, so that in the sugar cane there is absolutely nothing lost in the service of man. There is no doubt that the "bagasse" could be turned into some important industry, such as paper, which has been tried in the Island already, or carpeting or matting, or as an Irish friend of mine observed on picking up some of it, and using his olfactory powers, "Faith, whiskey could be got out of this," but the Mauritian planter will not so easily part with his bagasse. Apart from this priceless article of fuel, the planter who, in Mauritius, is at the same time a sugar maker, must have a certain amount of firewood to start working his "Usine," unless he has been fortunate to have a sufficient supply of "bagasse" in his sheds left from the preceding crop or harvest; but this is often the case now that the new furnaces (Fours-a-gradins, etc.), introduced from this country, and especially from France, consume large quantities of bagasse. Fuel is a most important item in the planter's budget, as much so as the guano item; the fuel question is getting more and more serious year by year, as the supply of wood in the Island is hardly adequate to the demand. This, however, is a minor difficulty among many others which the planter has to face in Mauritius, such as drought, disease, etc. It is not difficult to explain the prolonged droughts which at times fill our hearts with despair, when we find our beautiful forests

completely depleted to make room for the cane, a criminal act (I know no other definition) which has caused untold injury to the salubrity of the Island and which has been the cause of the ruin of many an estate in the lowlands bordering the sea as well as many in the Northern districts, deforestation producing stagnation of the water-courses, and bringing desolation into localities once smiling with luxuriant vegetation and happy with a thriving population, and where the fatal malaria was an unknown factor. One is at once prone to ask: Is there no remedy to this? The only radical remedy is for the Government to buy up all the lands surrounding the sources of the rivers and of the water-courses that supply water to the lowlands, and rewood those lands with good and hardy forest trees; this alone will maintain the continuous supply of the water springing up from the sources and restore health and prosperity to those parched up and now desolate regions where no one cares to plant the sugar-cane or even the cabbage, and "a fortiori" to pitch his tent. Alas! our Mauritius Government has lately been and is still passing through great financial difficulties which preclude it from doing anything in that direction, but the Mauritians will not and cannot believe for a moment that the Home Government will refuse to give them a helping hand in this vital question of reforestation.

Besides the droughts occasioned by the drying up of the water-courses, due to deforestation, the Mauritius planter has to battle against the various diseases which have been attacking different species of cane these last fifty years or more. As in the West Indies so in Mauritius, a widespread disease is caused by a fungus, chiefly the *Trichosphoeria*, an account of which will be found in the Royal-Gardens-Kew Bulletin of July, 1893, by Mr. G. Massee — also by an Acarus, the *Sarsonymus*, a microscopic insect attacking the cane chiefly under the leaves, this pest is commonly known as "rust," appearing as red spots; it attacks the young shoots, principally where the conditions of cultivation are defective. The planter cannot take too much care in selecting his cane tops for planting and rejecting all suspicious looking ones. The very interesting observations of Dr. Bancroft on the diseases of the sugar cane in the Kew Bulletin of April, 1890, are worth consulting. Above all diseases there is the invisible foe of the planter, the *Xyleborus perforans*, the "borer," so ably described by Mr. Blandofrd, F.L.S., in his elaborate report on the sub-

ject, published in the Kew Bulletin for July and August, 1892. The "borer" is said to have been observed for the first time in Mauritius on "Mon Loisir" estate in the Northern District about the year 1848; the old planters believe it to have been first seen in the "Penang" cane, at the time one of the richest species. The only remedy is to cut away the contaminated young shoot and burn it; the brown and dried appearance of the leaf is a sure indication of the devastation of one or two of these pests, very often a whole clump or stool of young shoots is eaten up by these destructive insects. It is an amusing sight to see a special gang of chocrus (young Indian boys), from five to ten years old, in a field with a glass bottle (generally an empty quinine bottle with a wide mouth) hanging on their bare breasts, into which they throw the full-grown larvae of the insect, carefully extracted from the contaminated stem by means of a small, sharp-pointed knife, the stem being cut away as far down the root as possible to be burned. The main object of the planter is to ensure the vitality of the canes, so that they may resist the attacks of disease and of insects, by selecting sound, healthy "tops" or good genuine canes from seeds, planting them in the right season, of which there are two in the year, namely, the "grande" (long) and the "petite" (short) seasons; the first, extending from October to January, is now as a rule the only season universally observed.

We generally speak of the sword of Damocles hanging over the head of a man risking his life and his money, but the Mauritius planter has not less than three sharp swords of Damocles hanging over his head. I have mentioned two already, drought and disease or borer; the other is by no means the least, being the most terrible of the three, for it can sweep away in one hour the labor and toil of many long years; our West Indian fellow-planters have just had a sad experience of this indomitable foe. On the 29th of April, 1892, our little island was visited by one of these foes, when hundreds, nay thousands, of acres of beautiful luxuriant cane fields were cut down and uprooted in every direction, nine-tenths of the sugar factories unroofed and seriously damaged, all the "camps" (the groups of the laborers' huts) on every estate razed to the ground within the space of one hour and a half, the havoc made by a terrific cyclone (unheard of in the memory of man for its fierceness) killing at the same time hundreds of men, women and children; outside the sugar estates no less than twelve hundred perished, and two thousand were injured in

the single town of Port Louis. In that memorably sad year the sugar crop, which promised to be the finest on record for the past decade, was reduced by thirty thousand tons on the preceding year (from 124,000 to 94,000), and in the following year, 1893-1894, reached only 87,000 tons. The Mauritians, planters and everybody else in the island, will never be able sufficiently to express their heartfelt thanks to the British public and to all others who so readily came to their help in such a time of trouble and distress. Thank God! such calamities do not befall the island every year or even every decade, I might venture to say, but the planter passes through very anxious times from the month of October to the month of May, the cyclone season so called; as he wakes up in the morning his eyes scan his barometer (an indispensable piece of furniture in the Mauritian home), at noon he refers to it once more, and at night ere he retires to a well-earned repose he consults his weather glass again.

When the cane is carted to the usine or factory it must be thrown between the steam rollers immediately, for exposure of the cut cane in the open air over twenty-four hours brings on fermentation of the saccharine juice which it contains; this is not uniform in all species, but as a rule such a long exposure is to be avoided. The complex machinery through which the juice has to pass after flowing from the rollers before it is converted into crystallized sugar is very interesting and to an outsider somewhat marvellous. The present-day "usine" in Mauritius, which produces from 25,000 to 30,000 lbs. of sugar per day, with all its mechanical up-to-date appliances for the extraction of the largest quantity of sugar from the cane, leaves nothing to be desired, the planter is but too happy to adopt any new improved piece of machinery which will ensure a larger extraction of sugar, provided he has sufficient capital in hand; unfortunately the times are getting harder every year for the sugar cane planter in all the sugar-producing colonies, owing to the abnormal and unfair competition of the bounty-fed beet sugar in the markets of Europe, India, &c.

Time will not permit me to speak of the improvements in machinery which have superseded the original rudimentary appliances of bygone years, such as the powerful steam mills with immense iron rollers from the firms of Blaikie Bros., of Aberdeen, Smith & Cook of Glasgow, Fives-Lille & Cail, of Paris, which have taken the place of the old wooden cylinders

worked by animal and water power—locally termed at the time "Systeme Nalartic"—of the "triple effect," and of the vacuum-pan, and of the large copper pans (the Defecators), all replacing the "Wetzels" and the "Battery" of the immense open iron boiling pans, for the sake of economy in fuel and in steam, also for a better concentration and clarification of the juice, implying above all an economy of time and of hands. In some "usines" the crystallized mass of sugar (the masse-cuite) from the vacuum pan is conveyed direct to the centrifugals, where it is converted into white, grey or yellow crystals, as the case may be, but many sugar makers believe this to be rather unprofitable, as this immediate transfer to the centrifugals (turbines) gives a smaller quantity of the first jet of sugar (the vesou-sugar) than would be desired. From the turbines (centrifugals), which are the last stage of the whole sugar making process, the sugar is allowed to cool in large wooden compartments or cases for an hour or more and then bagged first in an inner "gunny" bag (jute), imported from India, and then an outer bag made of the dry leaf of the "vacoa" palm (pandanus), grown on most of the estates, the total weight of a full bag being as a rule 75 kilos or 165 pounds; the lower jets, or the syrup sugars—2d, 3rd, 4th, and sometimes 5th "syrups"—are bagged in double vacoa bags.

With the system of machinery the Mauritius planter possesses today, he makes bold to claim a place in the first rank of sugar-makers in the world; were he not hampered and handicaped by the numerous and great difficulties he has to contend with, he would be able to do even still more by means of other perfected machinery such as is to be found in the sugar factories of Europe and Egypt, which I can confidently say more prosperous times would have enabled him to possess, and thus to compete with a certain amount of success against any beet or cane sugar factory in the world. The spirit of energy and enterprise with which the Mauritius planter is endowed bears him up with courage in trying new improved methods of work whenever he is able to do so. I might here cite the case of the diffusion process which is so successful in Egypt, and which was tried with the financial support of the local government on Britannia Estate in the southern district of the island, a very costly process as regards the fitting up of the machinery and especially so in the items of fuel and labor, which turned out to be the stumbling blocks. As long as the sugar maker is not able to get coal at Rs. 8 the ton delivered

at his door, instead of Rs. 30 at the railway station, or such a supply of cane as would keep his usine working continuously, so as to produce a total crop of 4,000 tons at least, diffusion in Mauritius will only lead to greater confusion. For the above reasons (cost of fuel and labor) and an insufficient supply of cane, "Britannia" had to go back to the rollers. Another estate "Mon Rocher," in the northern district, also tried the new process, but failed for the above and other reasons.

It is difficult to say exactly what is the maximum quantity of crystalizable sugar in the cane (apart from the "invert" sugar) which the Mauritius planter has been able to extract from his canes hitherto. I do not think I would be far wrong in saying that 12% of the crystalizable and 0.5% of the "invert" have been obtained, as a maximum, from presumably ripe canes. In order to find out the exact percentage of sugar, the planter would weigh his entire crop of cane (the whole quantity of cane carted to the factory), a rather difficult and somewhat impracticable thing to do in the hurry of work at crop time.

The main difficulty which the planter has to face at the present day is the low market price which his sugars fetch and have been fetching these last five or six years. In Mauritius generally one "arpent" (a little more than one acre) of land, after preparing it for planting, and after cultivating the cane, cutting and carting same to the factory, costs about Rs. 400, that is, one acre of virgin cane—which should yield 2½ tons (5,000 lbs.) of sugar at least—in order to get a profit on the sale of this crop of sugar, must fetch more than Rs. 8 per 100 lbs., as an average. Last year's crop did not, to my knowledge, fetch more than Rs. 7.80 to Rs. 7.90 on the average in more instances than one. Therefore the Mauritius planters are now doing their utmost to produce sugar at as low a cost as possible, many doing their best to produce at Rs. 6 cwt. (110 lbs. or 60 kilos), which, if they succeed, will enable them to get a net profit of one rupee per 110 lbs. on Rs. 7, which to all appearances seems to be the average figure for this year's crop. What with the varied claims which nine-tenths of the planters have to meet in the shape of interest on mortgages, payments of outstanding bills, apart from the heavy item of the budget, such as monthly wages of laborers, guano, rice and grain, mules and oxen, and above all, having to battle with that hydra-headed monster, the bounty system, which is enabling the French, German, and Austrian beet sugars to

overwhelm the markets of India and Europe, they (the Mauritian planters) are apt to lose heart and fear that they and their families will end their days in wretched misery, unless a gracious helping hand is extended to them from the home and Indian Governments in some form or other, so as to encourage and facilitate the introduction of their cane sugar in the United Kingdom and the British Colonies, where the Mauritius planter looks in vain for the "open door," that door being blocked by the bounty-fed monster. A ray of hope is, however, beginning to show itself through the dark cloud; the mercantile community in Bombay and Calcutta is, we learn, taking the subject into consideration, and the official authorities will no doubt study the question in an efficient and decisive manner. It is no fallacy to state that the so-much-to-be-desired question of the protection of Mauritius sugars imported into India ought naturally to engage the serious attention of the Indian Government, mainly because of the important and all absorbing fact that two-thirds of the inhabitants of Mauritius are Indians, and that the prosperity of the island, which hinges entirely on the sugar industry, is a question of life and death to them, as much as to the other elements of the population.

By the following comparative statement of the exports of sugar, it will be seen that India heads the list; Cape Colony comes next, while Australia, which was far ahead of those two countries in 1862, occupied the third place in 1896. Exported to India in 1862-63 (the first of exportation to that country) tons 8,275, in 1895-96, tons 48,630; to Cape Colony, 1862-63, tons 6,908, 1895-96, tons 16,828; to Australia, 1862-63, tons 34,958, 1895-96, tons 13,720. The first exportation of importance made to the Cape and Australia was in 1847-48, when the Cape took 4,286 tons and Australia 5,159 tons.

The above figures are in round numbers, as well as the following comparative statement of the sugar crops (exportation) of the last decade.

	Tons.
1886-87	102,376
1887-88	124,073
1888-89	132,172
1889-90	124,564
1890-91	129,443
1891-92	124,759

	Tons.
1892-93	94,097*
1893-94	87,408*
1894-95	139,489
1895-96	117,430

*Consequences of the great cyclone.

An average of about 118,000 tons per annum, reckoning 1,000 kilos to the ton.

The above is an extract from Garrioch's Mauritius Almanac, 1889 and 1898, also the following:—

The largest values in rupees of the above crops is that of 1895-96, viz: Rs. 29,855,640. The smallest is that of the cyclone crop of 1892-93, viz: Rs. 15,346,233.

The present crop (1898-99) promises to be the best on record for many years past, being estimated at more than 150,000 tons.

Mauritius has now become, I venture to say, a small paradise to the large coolie element introduced into the country as agricultural laborers from the three Presidencies of the Indian Empire since 1835. The coolie laborer, after his first five years of indentured service, is free to renew his contract of service with his employer for a year or two more, or to return to India, or to be a gentleman at large. I am happy to state that three-fourths renew their contracts with their former employer or with a new one on some other estate, and after continuing this mode of life for a certain number of years they become landed proprietors—cane planters supplying the factory in the neighborhood with annual crops at a small profit on their expenses for planting, which are next to nothing, and thus contribute in a measure to the prosperity of the island. The Mauritius planter is not so blind as to see that he owes a great deal to these Indians, who are as a rule a fine race of men, intelligent, hard-working and thrifty, hence it is his object to do his utmost in making them as happy as he possibly can. One rejoices to find on some estates two and sometimes three generations of the same Indian family.

The question of coolie labor has been a very vexed one with several of our Governors; one, whose name I cannot overlook in this paper, and one who has always had the interest of the planter as well as that of the laborer at heart, is Sir Arthur Gordon, now Lord Stanmore, who "took the bull by the horns"

and inaugurated an era of contentment and happiness for our Indians, which has resulted in a more cordial entente between laborer and planter than ever before. Sir Arthur bequeathed to his successor, Sir Arthur Phayre, the difficult task of passing and enacting the new labor law, which, however seemingly vexatious and annoying to the planter at first, has now become a covenant of mutual good-will between employee and employer.

Another evidence of the material welfare of our Indians is that more than one, after fifteen or twenty years' residence in the island, have had to their credit in the Government Savings Bank over and above Rs. 20,000 and more than one are now planters and owners of sugar estates.

With its large Indian population and other elements of various races, Mauritius, that gem of the Indian Ocean, though an insignificant jewel in Queen Victoria's crown, shines with as bright a lustre of loyalty and devotedness to Her Majesty's person as any larger diamond in our beloved monarch's diadem. The Mauritians cannot and will never give up the hope and confidence they have in their Most Gracious Sovereign's affection for her loyal subjects in their time of trouble, however remote they may be from the footstool of her throne.

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TO MINIMIZE THE RISKS AND ENHANCE THE CHANCES OF PROFIT IN CANE CULTURE.

Thos. M. Gage, in Louisiana Planter.

The tropical cane within the past six months has passed through an ordeal probably more severe than at any previous period since its first introduction into the State, and its survival should place it in the front rank as one of the hardiest plants grown by the agriculturist in temperate climes, as it withstands climatic extremes better than cotton, corn or tobacco, the chief staple crops of this latitude. The detrimental meteorological influences in such combination may not be witnessed again in half a century, and none at present living seem to admit having seen the like in the distant past. The excessive rains in the fall, the absence of sunshine, and too early cold, were derogatory to the development of saccharine, and the canes were in wretched plight both for seed and the factory. The evil was intensified by the prolonged supersaturation of the soil not only during the winter, but in some sections there was but little improvement until near the end of

February, consequently the seed in the windrow was defective and the vitality of the stubble was impaired, very notably in the tenacious, and partially drained black soils prior to the advent of the lowest temperature ever recorded in this latitude.

The growers of crops of every variety the world over sustain serious losses from time to time from adverse meteorological and other influences, and the cultivator of cane must be prepared to sustain similar losses at intervals. To minimize risks should be the aim of the agriculturist, yet here the preservation of seed cane being of paramount importance, some of the prime essentials are either ignored or neglected, from which serious losses accrue, particularly when the somewhat unreliable ratoon crop is a partial failure. Many fields of cane put in windrow last fall were very unsuitable for seed after the storm in September, as the stalks were crooked and continued immature, and many of the top eyes became elongated —conditions extremely unfavorable any year; but intensified this last season by adverse climatic influences.

Some who have given the subject much consideration are inclined to the opinion that the canes are (like some other plants similarly treated) being impaired in hardiness by the too frequent application of large doses of improperly balanced fertilizers—where there is a paucity of soluble phosphoric acid and potash and a preponderance of nitrogen in a potential form which becomes available by a more or less gradual decay or transformation—due to the action of myriads of micro-organisms. Nitrogen in certain forms, or at times, has, an effect yet unexplained on plants, as is witnessed in the elongation of the eye of the canes grown in fields seeded with cow peas when laying by the crop. Fresh vegetable or animal nitrogen applied to newly seeded beet fields will develop plants with a low sucrose content. The pea plant, after undergoing decomposition becomes an admirable manure for cane, and such is also the case with animal and vegetable nitrogen as found in tankage and cotton seed meal if supplemented with a fertilizer when the soluble phosphoric acid and potash preponderate.

After having been subjected to many vicissitudes rarely or never before encountered, the seed cane which has sustained the least injury is found on sandy soils, with a moderate, uniform covering, the tonnage not usually exceeding sixteen per acre; the stalks relatively straight, with the eyes in a

normal condition, and the land, evidently, free from extraneous vegetation when the windrows were formed. They were generally ratoons of the first and second year, and had been stimulated with but a limited amount of fertilizer. The past season will be an object lesson in the treatment of canes destined for seed, and in the future fewer risks will be incurred than in the past. Sound seed cane, being of such vital importance, and very expensive at least, too much care cannot be bestowed in its culture and after preservation; yet in later years one could at times see canes that had been heavily fertilized—green, crooked, with enlarged eyes, and of heavy tonnage—severed sometimes six inches above ground by a motley crowd, many of whom never before windrowed a cane, who tossed the stalks indiscriminately one over the other in the rows in their efforts to keep pace with veteranse at the work, hence seed of varying quality in the same field. After the windrows were made, the crooked mass, full of large air spaces, with many of the butts not touching the ground were covered with thick, tenacious furrow slices which retained the heat generated by the fermentation of the luxuriant leaves, at a temperature sufficient to injure the vitality of the swollen or elongated eyes. Nature in her efforts to replace the moisture evaporated at the eyes and nodes of the upper joints of the canes utilized the liquid near the butts, which in consequence became sponge-like, and when the windrows became saturated later, water was imbibed and the lower ends of the stalks became defective from what is generally styled wet rot.

Stubble fields, the ratoons of which are destined for seed, should be specially fertilized and cultivated. Chemicals may be more costly than other manures, yet the superior quality of the canes for seed will justify the extra expense. As a heavy tonnage is not sought, thorough tillage to exterminate noxious vegetation and place the soil in fine physical condition should, with an application in most instances of 300 pounds of high grade chemicals, with soluble phosphoric acid as the dominant, insure healthy growth in June, July and August, after which vegetation should be checked through the exhaustion of the stimulating fertilizer. As late cut canes generally ratoon the best, a portion of the stubble of the first year could be left until the very end of each campaign, and the stubble therefrom the next year retained from which to grow canes for seed. Such fields would be virtually manurially exhausted, and the tonnage output the more easily controlled.

If it pays the beet growers of Europe to expend both time and money to secure seed of high quality, it will certainly pay the cane growers to strive to have sound stalks for annual plantings, very particularly as the latter are the more expensive, and add materially to the cost of production of cane sugar as compared to that from beets.

The unprecedentedly low sucrose content of the canes during the last campaign, and the very probable curtailment of the coming crop will tend to, in some measure, revolutionize agricultural methods; because the conviction is becoming more widespread that the quality of the canes cannot be sacrificed to mere quantity either for seed or the factory. Canes of a relatively high saccharine strength must be produced or the industry must suffer a diminution in the chances of profitable production, therefore more attention will be bestowed on the quality of the plant food furnished the growing crops.

Every furrow slice cut to form the ridge, quarter drains, ditches and canals to free the fields of water is work performed to counteract the injury from excessive rains, and improve the physical quality of the soil, which more than aught else enhances the chances of success in special cultures in most countries. Much stress is laid by some on the necessity of soil analysis to guide in the application of manures to the cane fields of the State; when it is in most instances of very secondary consideration when compared with the necessity of thorough drainage and tillage.

The "Sugar Cane," by Prof. Stubbs, page 54, contains the following: "An average cane crop of 25 tons, including tops and fodder, will contain about the following: Lime, 20 pounds; potash, 60 pounds; phosphoric acid, 35 pounds, and nitrogen, 75 pounds. In an acre to the depth of 12 inches, estimated to weigh 5,000,000 pounds, there would be 25,000 pounds lime, 20,000 pounds potash, and 5,000 pounds each of phosphoric acid and nitrogen. Hence there is lime enough for 1,250 crops of cane, potash for 333, phosphoric acid for 150, and nitrogen for 70." Although the cane soils contain such quantities of plant food according to chemical analysis; yet past experience has proved that the tonnage yield per acre on lands which have been under cultivation for fifty years, would, in most instances, prove disastrously low without a rotation with some leguminous plant or the application of extraneous manures.

At one period in the history of the industry progressive planters deemed it the practice for excellence to rotate with corn and peas at least once in four years, and on many of the best cultivated estates one-third of the plantation was reserved for plant cane, one for ratoons of the first year and the balance for grain and the pea vine crop. During and since the advent of the bounty system, growing cane after cane became largely de rigueur, and the application of fertilizers has increased from three hundred pounds per acre to, in some instances, over twelve hundred pounds. When it is remembered that these large amounts of manure containing plant food are not thoroughly incorporated with the soil, but often left in a continuous mass in the furrows, where decomposition is retarded, and the roots unable to absorb rapidly, little cause for wonder that quantities of immature cane have been sent to the factories.

The time has arrived in the history of the industry when sentiment, past practices and prejudices are being rapidly ignored when the chances of profit are curtailed through their instrumentality. The tropical cane in this latitude is a slow grower until the warm weather in May, when the young sprouts begin to root independently of the parent stalks or stumps, after which, if the fields are in a physical condition such as to aid in the retention of soil moisture, and the land rich in soluble plant food, stalk development will progress rapidly in the month of June (although hidden from view by the leaves), on which much depends to produce tonnage with a relatively high sucrose content, the quantity of sugar to be obtained per acre depending very materially not only on the friable condition of the soil, but on the time of application and quantity and quality of the extraneous manures. To apply immediately available elements in greater variety (as the compound manure should contain ammonia, nitrates, soda, potash, lime, sulphuric and phosphoric acid) to accelerate stalk elongation in June, July and August, instead of ingredients upon which the crop must await decomposition (tardy at times and too prolonged) will be to enhance the chances of securing canes during the campaign, relatively rich in saccharine, with a high co-efficient of purity, which will increase the value of the raw material to the seller and also the buyer, as the fuel bill and other varied costs in manufacture will be decreased.

As it is admitted that the nitrogen in sulphate of ammonia and nitrate of soda gives better results than that found in

either cotton seed meal or tankage (although more expensive), and that bones subjected to the action of sulphuric acid are preferable to bone meal or tankage, a problem presents itself to the cane growers (whether sellers or otherwise, as canes in the future will be valued according to saccharine richness, and the purity of the juice) to be solved by actual field trials and chemical analysis. Select a twenty-acre field of first ratoons (unmanured) as plant cane, and on ten acres apply 600 pounds of chemicals with 7 per cent nitrogen and 7 per cent phosphoric acid, and on the other ten acres apply 600 pounds of tankage with 7 per cent nitrogen and 7 per cent phosphoric acid. Each experimental area to be manured, say, on the first of May. If the test were repeated for a term of years it would be found that the former ten acres would make more tonnage in June, July and August, and on the first of November would have less immature tops, and the increase in sugar content per acre would not only pay for the extra cost of fertilizer, but give a handsome profit on the investment, because of the availability of the plant food just when the canes should make their most rapid growth, and more time given to mature where the period is so limited as in this latitude. Under existing conditions no marked change will be made in the ingredients used, but when the canes are bought and sold according to chemical analysis, showing the available sugar per ton, then cane growers will be stimulated to deliver raw material of higher quality at the factories whose owners will the more fully appreciate the value of such as compared to canes with a low sucrose content and purity coefficient.

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THE COTTONY CUSHION SCALE.

So far as known the Cottony cushion scale has never been found in Florida except at Clear Water Harbor. Some five or six years ago it secured a lodgment in the nursery stock of Duncan Bros., near Clear Water, and was supposed to have been completely ridded out by Prof. Rolfs at that time. However, it is now established over an area of perhaps something like twenty acres in and about the city of Clear Water Harbor, whether from a new importation from California or from a survival of the old introduction already mentioned we have been unable to determine. This insect is a native of Australia, where it is rendered comparatively harmless by the great numbers of its natural enemies. It was introduced into California

possibly as early as 1868, and after spreading with comparative slowness for some six or seven years it began to secure such a foot-hold as to alarm the California fruit growers, and it was but a few years—not more than five or six—from the time that it was recognized as a really dangerous pest, until many of the California orange growers were abandoning their groves, and expressing themselves as being completely discouraged at the outlook for orange culture in that State. Perhaps two-thirds of the California orange interests had been destroyed before anything like an effectual check was placed upon its ravages. The various insecticides and washes which are commonly resorted to for fighting scale insects were tried with very indifferent success, and it was not until an agent from the United States Department of Agriculture was sent to its native home in Australia to procure specimens of its natural enemies that any really hopeful means for fighting it were found. Mr. Koebele, the investigating agent in Australia, among various parasites and predaceous insects feeding upon it there, found a species of lady-bug which he sent to California, and in less than two years it had brought the scale within control. While California has never succeeded in entirely ridding herself of the scale, the lady-bug and drastic laws together, have rendered its work comparatively harmless in recent years. I fear the scale has already secured such a lodgment in Florida that we may have great difficulty in ridding ourselves of it entirely, but we have already made arrangements to introduce the lady-bug of California, and if the good people about Clear Water Harbor will exercise unceasing vigilance for two or three years to come we may at least hope to hear of it no more.

So far as known at present, the scale is to be found upon the following premises: Upon rose bushes in the yard of E. J. Armstrong, also upon roses in the yard of Mrs. Pierce across the road from the Verona Inn; in the orange orchard of Mrs. Pierce; upon roses on the property occupied by P. S. Dance; upon roses on the Gould premises, and upon roses in the yard of M. V. Scranton; also along both sides of the railway track south of the depot, extending perhaps about one-eighth of a mile in great numbers. The undergrowth of this latter district is literally alive with it.

Persons not knowing the insect and desiring to see specimens will find same in glass vials in the office of the West Hillsboro Press.

The wooly coating of the female insect covers an egg sack containing hundreds and sometimes more than a thousand of eggs will hatch in midsummer in a few days, though in the winter the young may not issue for some months. The larvae are able to do without food for a number of weeks, crawling about hunting some suitable food plant, and they are able to sustain life upon almost any vegetation for a long time, but only multiply rapidly upon such things as citrus plants, Acacias, etc. The newly hatched larvae settle upon the leaves and tender twigs, inserting their beaks and imbibe the sap. On passing into older stages of development they settle upon the smaller twigs. Only a few are found upon the leaves and fewer yet upon the larger branches and trunk. The adults, however, almost invariably prefer the trunk and larger branches. The insect is rarely found upon the fruit, but occasionally it is transported by the shipment of fruit. Generally speaking, the wind is apt to be the most effective agent in scattering and transporting the insect. It is next most likely to be transported upon scions and nursery shipments. Birds may carry it upon their feet and feathers. The lady-bugs sometimes carry it upon their bodies. The ants may also be agents of scattering them. Running water often floats infested leaves and weeds to new localities. For the present, I shall confine myself to the following recommendations: That no bouquets nor slips be taken from the premises that I have named on any account. If the owner, or those occupying the premises having infested rose bushes, will loosen the roses from their fastenings to the porches and train them upon the ground or some suitable support away from the buildings for some time, it will simplify treatment and prevent the scales from harboring in the crevices and corners of the porches. Picking them off by hand is not apt to effect very much, as some, or a few of the eggs are almost certain to be left behind by such a process. Brushing them off on the ground merely removes the egg mass to a new locality, and while it may diminish the multiplication somewhat, it is obvious that many of the newly hatched young will find either the same bush from which the parent was removed or some other suitable plant on which to fasten. They would better be brushed off on a paper and the whole committed to the flames.

The only certain method of getting rid of them from the rose bushes is by burning the whole bush. Those bushes that will bear cutting back may have all the smaller branches

trimmed away and burned, and then with a moderately stiff brush, such as a paint brush, scrub the whole stock with a good kerosene emulsion. The prairie district along the railroad track will have to wait the introduction of the lady-bug, or a subsequent visit of the entomologist. The infested orange grove was seemingly quite free from living scales, and it is possible that it will need no special treatment until the introduction of the lady-bug, and indeed it will perhaps be unnecessary to destroy even the rose bushes if we get the lady-bugs soon. All action of this character may be deferred until such time as may be named in a later communication from my office. It is to be hoped that the people of Clear Water will realize that perhaps the orange and citrus industries of Florida are in their keeping, and that no vigilance or reasonable expense should be wanting at this time to completely eradicate the scale if such a thing is possible.

Mr. Jno. A. Duncan, Mr. Jno. Thomson and Mr. D. N. Starr will be in regular communication with the entomologist, and parties desiring special information are advised to consult either with them or write directly to my office at Lake City. It is due to the vigilance of Mr. Duncan and Mr. Starr that the presence of this insect in Clear Water at this time became known. I trust that parties having infested premises will afford these gentlemen every opportunity possible to carry on the work of extermination, and will cheerfully accept any action that they may deem best to take under the advice of the entomologist.

H. A. GOSSARD,
Entomologist of the Florida Experimental Station, in West Hillsboro Press.

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THE MAELSTROM.

Such is the designation given by the New York Journal of Commerce to the present craze for forming trusts and huge corporations. It calls attention to the fact that up to the beginning of March there were organized in the two preceding months 353 combinations, compared with 200 during 1898, with the following aggregations of capital stock and bonded debt, compared with a year previous:

	1899.	1898.
Common stock	$4,247,918,981	$2,889,757,419
Preferred stock	870,575,200	393,764,033
Total stock	$5,118,494,181	$3,283,521,452
Bonded debt	714,388,661	378,720,091
Stocks and bonds . .	$5,832,882,842	$3,662,241,543

During the month the movement gained additional force, until now the stock and bonds of incorporated trusts exceed the total value of the entire manufacturing industries of the United States as reported by the census of 1890. Our esteemed contemporary says:

"The change is the most stupendous revolution ever accomplished in the history of the world's industrial growth. Its suddenness is as remarkable as its magnitude. It has come with none of the careful deliberation that usually attends the investment of great aggregations of capital. It has been guided by no precedent experience. It is no gradual result of a natural evolution. It is an abrupt outburst of resistance to an unusually severe pressure of the natural regulatory force of competition. It is a reversal of all that economists have accepted as fundamental axioms of trade. It is an undeliberated revolt against the most essential values—the natural law of competition. It amounts to a complete disruption of the relations between the industrial forces and classes of society. It is an extinguishment of the voluntary exchanges between the producing and merchanting interests, and the creation of one exclusive producing organization for each industry, to which all other material interests must yield subjection. Industry at large is organized into a system of feudalized corporations, each one of which enjoys absolute power within its special branch of production, while, taken in the mass, the system constitutes itself the supremest trade power in the nation. These innovations upon the fixed methods of industry, though fundamentally affecting the citizen's free access to the opportunities of industrialism, take little account of legalities, equally ignoring the law as it stands and as it may possibly be changed to meet the case. This headlong precipitancy has pursued its purpose almost without forethought; certainly with slight consideration for trade moralities or for the weightiest of human liberties, and with little

regard for the perils to public order which the outworkings of the system are too liable to evoke.

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The change, however, is now a fixed fact. It places nearly our entire industrial system upon the monopolistic basis. That is a venture unparalleled in the history of material civilization; and not merely the manufacturing interest, but the still vaster interests thereon dependent, can but await the outcome with an expectancy that must grow more intense as the trial progresses."

The Journal of Commerce assumes that the movement is "upon the monopolistic basis." Is this position sound? Do not over-capitalized trusts invite the very competition they seek to overcome? Are not most of the trusts the result of the work of professional promoters, who find in manufacturers anxious to overcome the evils of unrestricted competition willing victims to their schemes ?

Short as is the history of the trusts, have they not already developed the fact that organization does not destroy, but rather enhances, competition ? Was there ever a more bitter warfare in that direction than is now raging between the Sugar Trust and the independent sugar refiners ? Is not a less vigorous fight on between the Diamond Match Company and its new rivals ? And scarcely had the Baking Powder Trust been organized before fresh competition developed. When the biscuit companies were first organized, one of the leading spirits in the trust remarked that "bakeries sprang up like mushrooms all over the country."

Does not the history of the National Cordage Company and the wrecks of scores of trusts testify that none of them became a monopoly, and that every attempt to absolute control broke down ? Was not the Standard Oil Company forced, by Russian competition, to divide the foreign territory with its rival ?

Can the trust absorb men as long as the individuality of the man counts for more than machinery or money ? The individual always has and always will assert himself, even though it be to form combination against combination; to array organized producers against organized users of raw materials; to devise new patents to supersede the old, just as the new motive power displaces the old. If there is no monopoly of brains, will not man be free to exercise his power, and will not that power keep down monopolies ?

The disintegrating feature of trusts is that most of them are forced to distribute net earnings among the stockholders, instead of adding them to working capital, as does the individual who goes from small to great achievements.

In time, the evil of excessive stock issues will work its own cure; in fact, it has begun already, for in Wall street the banks are refusing to accept as collateral the bonds and stocks of the trusts, which in many cases are the football of reckless speculators or financial kite-flyers. The money market is disturbed and sensitive, owing to the enormous demands made upon it for the financiering of over six billions of bonds and stocks of newly-organized combinations.

If trusts were monopolies, we would grant the conclusions drawn by the Journal of Commerce, and answer in the affirmative its questions as to the new relations of the trusts to the producer, the consumer, the exporter, the laborer, the banker, and the middlemen.

The need of the hour is not the extermination of trusts, but supervision by the State that will guard against excessive issue of securities and force semi-annual statements as exacting in nature as those required of the National banks under the National Bank act.

The common law is ample to protect against monopoly, but additional legislation is necessary, to regulate organized capital; the outcome of the new condition forced by steam and electricity and the fierce competitive forces of our time.

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THE BEET SUGAR PROBLEM.

When Secretary Wilson entered the cabinet he expected to identify his name in history with the beet sugar industry in the United States. He had long believed that this country should raise its own sugar, and pay the bills. Just as the tin-plate business has recently been established here, so that we now have the largest tin-plate factories in the world, he hoped that this Administration would mark the complete establishment of the beet sugar industry. Such may yet be the case. But by peculiar irony of fate, it also fell to this Administration to acquire a vast amount of tropical country, of which the sugar cane is a leading product. According to the obvious intent of the constitution, this cane sugar would have come in free and the beet sugar industry been given a knock-down blow. But as Mr. Wilson and those who agreed with

him in the councils of the President were not willing to give up the beet sugar idea, they have given impetus to the notion that in some way a tariff wall against our tropical possessions would be maintained. When the historian comes to write of the sequences of the Spanish war, and this probable change of our tariff policy, he can explain this change by the one word "sugar." In this way the great product is making history.

Although Secretary Wilson has felt sure that the products of Porto Rico and the Philippines would not be admitted to our markets free, he has had no little concern over the future of his favorite industry. Some time ago he detailed Mr. C. F. Saylor, who is the special agent in charge of the suger experiments of the United States, to go to Porto Rico and there investigate the sugar problem in its relation to the beet sugar problem in the United States. Mr. Saylor has just returned. He does not talk politics, and will not discuss the constitutional and revenue side of the sugar problem, but from his findings of fact it is very easy to draw positive conclusions. He finds that the Porto Rican can raise sugar for two cents a pound, and that the American beet grower can raise sugar of the same standard for 3¼ cents a pound. In this light, it looks as if the tariff would continue to be necessary to keep up our beet sugar industry. Mr. Saylor believes that this disparity in the cost of production in the two countries will lessen as time goes on, but the reasons which he assigns for it will not be accepted by all economists. For instance, he says that the Americanization of Porto Rico will mean higher wages there, and that with higher wages Porto Rico will be unable to produce sugar for two cents a pound. This brings up the old question of the economy of low wages.

"The relation of the Porto Rican cane sugar production to our beet industry is a question for the future to work out," said Mr. Saylor to our correspondent this morning. "Porto Rico can produce sugar a great deal cheaper than we can. The labor employed in the industry, both in field and factory, is largely unskilled, and the average wage is fifty centavos per day, which would be in American money about thirty cents. Bricklayers, carpenters and skilled workmen of all kinds get what would be about sixty cents in our money. As to efficiency, I believe the ordinary laborer of our sugar beet regions would be worth three Porto Ricans; but I doubt if our laborer would be worth any more than the Porto Rican if he had to

live in the same country and eat the same food. The insufficient food ration seems to me at the bottom of this notorious inefficiency. Half the people of the island live on less than five cents a day, and where the sugar factories feed their own hands, they allow only seven cents a day per man for that purpose. In the morning the Porto Rican eats a piece of bread, and what is called coffee; at twelve o'clock he eats a breakfast consisting of a piece of bread, something to represent our potatoes, some tuba, which is mostly starch, and beans cooked in the form of soup. This soup is about the only nourishment they have. The evening meal is the same. They rarely eat meat. I have never seen them have any except as particles in their soup. It would not be extravagant to say that the larger part of the inhabitants of the island live on less than three cents a day.

"Porto Rico is one of the most fertile islands in the world. It is a gem. Inefficient labor and bad methods have been its greatest drawbacks. They can produce readily from their first crop and on their best lands forty or fifty tons per acre, and the ordinary crops average from twenty to twenty-five tons through the island. Sugar, coffee and tobacco are the three staples of the island, and as these are crops which do not readily rotate, sugar has been produced on the same lands sometimes for a century. This great fertility of the soil and the cheap labor enables the Porto Rican to produce sugar for about two cents a pound. When it is brought to market in this country it meets a tariff of $1.65 per hundred weight. It costs him fifteen cents more to ship it. But the island is now producing only about three per cent. of our present consumption, and under most favorable conditions would probably furnish not more than 5½ per cent. So Porto Rico does not put an obstacle in the way. The real sugar question will come with the other islands, particularly Cuba and the Philippines.

"Our beet-sugar manufacturers are able to produce sugar for 3¾ cents a pound. The quality of the two, our own and the Porto Rican, is the same, and chemically both are known as cane sugar. Under the microscope they show the same crystalization. We use about 2,000,000 tons of sugar per annum, which is about thirty per cent. of the world's product. Of our sugar, about forty-five per cent. of what we are now consuming is made from the beet. We are importing 84 per cent. of our total and making 16 per cent. at home. Cuba alone has

produced a million tons a year, or about one-half the cane sugar of the world, and under favorable conditions she could produce considerably more. The Philippine Islands are also great cane sugar producers. Our increase in consumption of sugar for the last quarter of a century has been remarkable, about 12 per cent. per annum, which is greatly in excess of the increase of population. We have developed a myriad incidental uses for sugar, in tincture, syrups, jams, preserves, confectionery, and as we are a great fruit-raising country, sugar becomes necessary in preparing our fruits for market. Therefore the sugar question is one of the utmost importance.

"In this country we are now producing 289,000 tons of cane sugar, 41,000 tons of beet sugar, 5000 tons of maple sugar, and 300 tons of sorghum. In the last year we have doubled the number of beet-sugar factories and more than trebled the capacity of their output. Claus Spreckels, who is a good judge of the future of the industry, has erected a factory at Salinas, California, which has a capacity for working 3000 tons of beets daily. This would make a freight train laden with sugar beets more than a mile long. Henry Oxnard has built a huge factory near Huenene, Cal., and other factories are in operation in California, Oregon, Utah, New Mexico, Minnesota, Nebraska, Michigan, Illinois and New York. Eight factories are now building, of which six are in Michigan.

"If Porto Rico is to be really Americanized the wages of her laborers will be increased, and the standard of living raised. This will make the cost of production in her industries considerably higher. The better paid labor, on the other hand, will be better fed and so produce more. But the general effect will doubtless be to increase cost. In this country the by-products of the beet will be of increasing importance. The creamery industry follows on a large scale right in the wake of the beet sugar, and to an extent the two will go together."

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NITROGEN AND PLANTS.

The Madras Mail gives the following report of a lecture on "Atmospheric Nitrogen in its Relation to Vegetation" delivered by Dr. W. J. Leather, Agricultural Chemist to the Government of India, at the College of Agriculture, Saidapet.

The lecturer, in introducing the subject, thought it would be as well to set out briefly the reason why it occupied and still

occupies an important place in the field of agricultural research. Early in the history of chemistry it was determined that all plants were built up of two distinct classes of substances, one of which became dissipated on heating while the other did not. The composition of the latter, or mineral, portion was only accurately determined later on, but it was readily recognized that the plant must rely entirely on the soil for a supply of its mineral ingredients. Regarding the portion which was dissipated on heating it was discovered last century that this portion consisted of compounds of carbon, hydrogen, oxygen and nitrogen: and it has been known for over half a century that plants obtained the greater portion if not the whole of their carbon and a part of their oxygen from the atmosphere, and that most of the water entered through the root, the supplies of these substances being practically unlimited.

The question was whether plants obtained their nitrogen from the soil or from the free nitrogen of the atmosphere. The first experiment was made in 1779 by Priestly, who, working with primitive apparatus, came to the conclusion that plants assimilated the free nitrogen of the atmosphere. Twenty years later De Saussure, as the result of his experiments, came to the opposite conclusion. In 1837 Bussingault investigated the matter with indecisive results, but he again attacked the subject in a more thorough manner in 1850 and subsequent years. He grew plants from seed in a soil which was capable of supplying the necessary mineral matter, but which did not contain any compound of nitrogen. The whole was enclosed in a large glass sphere, which was occasionally supplied with carbon dioxide, a supply of water being given to the soil. In this way the compounds of nitrogen were as far as possible put out of reach of the plant while the free nitrogen of the atmosphere was in contact with it. His experiments showed that the nitrogen in the plant was practically the same in amount as that originally contained in the seed—in other words that the plant did not assimilate atmospheric nitrogen. These results were subsequently confirmed by other experimenters, notably Lawes, Gilbert and Pugh, of whose apparatus and methods of procedure the lecturer gave a detailed account with the aid of the necessary appliances.

The question could not be allowed to rest here, for there was a generally expressed opinion among British farmers that

clover, in addition to producing excellent crops of hay, enriched the soil for a succeeding crop of wheat or barley, and further that all competent investigators admitted that the question, in spite of the results already mentioned, was not fully solved, while some of the field experiments seemed to confirm the British farmers' opinion. Hellriegel and Wilfarth carried out a series of investigations on the relation which existed between the amount of plant food in the soil and the weight of crop obtained. Plants were grown in sterilized soil in a series of pots having a good supply of plant foods other than nitrogen. In one pot of a series there were no compounds of nitrogen present; in a second pot a small amount of combined nitrogen as sodium nitrate; in a third pot twice as much and so on. It was found that in the case of the Graminaceae and some others that the weight of plants produced depended largely on the amount of combined nitrogen supplied, but that with the Leguminosae the yields varied. Further, the striking fact was demonstrated that pea plants grown in sterilized soil with no supply of combined nitrogen in some cases grew luxuriantly, while in other cases their growth was limited to the supply of nitrogen in the seed. The roots of the stunted peas resembled those of other plants, but the other of the luxuriant peas had developed numbers of nodular protuberances. The question was, therefore, raised, whether this phenomenon was in any way connected with the action of micro-organisms or microbes. Further experiments showed that the leguminosae, did not thrive in cultivation pots from which all micro-organisms were excluded, that these plants developed nodules on their tubercles and thrived well if the cultivation pots were watered with muddy water obtained by slaking fertile soil with water, but not if this water was previously sterilized by boiling. The lecturer then described the experiments in detail and summarized their results as follows: Plants belonging to the natural orders Graminaceae, Cuciferae, etc., did not assimilate atmospheric nitrogen; plants belonging to the sub-order Papilionaceae (order Leguminosae) assimilated atmospheric nitrogen if certain micro-organisms were present in the soil. The experiments of Hellriegel and Wilfarth have been corroborated by Lawes and Gilbert. The lecturer then proceeded to give in detail the evidence tending to prove that the nodules mentioned were due to inoculation, and said that certain bacteriologists

had separated organisms from these nodules. Nobbe, it appears, has grown these organisms and has placed them on the market in suitable vessels ("Nitragin") so that soils deficient in the organisms may be supplied with them. Regarding the practical utility of "Nitragin" the information at present available seemed insufficient to base any opinion on the matter. The lecturer incidentally pointed out that some of the lower forms of vegetable life such as Algae and Lichens seemed to be capable of assimilating free nitrogen, which accounted for the phenomenon noticed by some observers that land left apparently bare showed an increase in the amount of nitrogen present. The question "in what way do bacteria assist certain plants in assimilating atmospheric Nitrogen" was answered by Lawes and Gilbert as follows:—"The alternative explanations of the fixation of free nitrogen seem to be: 1st, that under the conditions of the Symbiosis the plant is unable to fix the free nitrogen of the atmosphere by its leaves; 2nd, that the organisms become distributed within the soil and there fix nitrogen; the resulting nitrogenous compounds becoming available as a source of nitrogen to the roots of the plant; 3rd, that the free nitrogen is fixed in the course of the development of the organisms within the nodules, and that the resulting nitrogenous compound are absorbed and utilized by the host." The third suggestion seemed the most likely one.

Leaving aside the purely scientific aspect of the question, the lecturer said he would like to deal with the practical side of it. It was true that through the agency of pulses the land became enriched to a certain extent for a subsequent cereal crop. But experiments carried out at Cawnpore and elsewhere showed that the root residue of a pulse crop could only be relied upon to increase the cereal which filled it by about ten per cent., which was very little compared with the increase which could be obtained by the use of nitrogenous manures. Doubtless the part played by pulse crops in India was an all-important one, but it would be folly to trust to such crops alone to replenish the soil and to neglect the use of cattle dung and other manures supplying nitrogen to the soil. The soils of India were very poor in nitrogen; and this left only one conclusion to be drawn, namely that, although our pulse crops were annually assimilating some nitrogen from the atmosphere, the amount so brought into combination with the soil was not sufficient either to increase naturally the store of this all-important plant food, or even to maintain it at a high level.

TEMPERATURE AT HONOLULU FOR 1898.—W R. CASTLE, OBSERVER.

Day of Month.	Jan.			Feb.			March			April			May			June			July			Aug.			Sept.			Oct.			Nov.			Dec.		
	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.	6 a. m.	1 p. m.	9 p. m.
1	66	74	69	70	77	74	62	74	65	67	76	68	66	78	71	70	82	73	67	83	74	75	83	75	73	85	74	73	84	76	73	81	75	72	78	73
2	67	76	70	73	78	76	62	76	67	68	76	68	67	78	71	67	82	73	72	85	75	71	83	75	73	86	75	74	83	77	74	81	76	71	79	74
3	68	75	70	70	73	68	67	73	67	67	76	67	69	80	74	68	82	70	75	82	74	72	82	75	71	86	73	73	80	76	74	80	75	72	79	75
4	65	75	66	63	76	68	67	71	67	68	76	70	71	80	73	69	82	73	73	80	74	71	84	76	76	86	76	74	82	77	74	81	76	71	78	74
5	68	73	68	62	77	68	67	75	68	68	77	66	72	78	72	70	81	69	70	81	72	72	83	75	80	86	77	74	82	76	74	78	75	69	79	72
6	67	72	68	63	80	69	65	72	68	68	77	67	72	80	73	68	81	71	67	83	74	73	84	76	74	85	78	75	81	75	73	79	75	73	75	74
7	66	75	68	63	77	69	65	76	68	61	77	67	71	79	71	69	83	71	70	82	71	75	83	75	73	83	73	74	82	76	72	81	74	71	79	72
8	66	73	68	65	80	71	67	76	69	65	76	68	70	80	72	69	80	70	72	80	74	71	84	77	73	83	76	74	82	77	73	81	75	67	77	67
9	66	76	70	66	78	70	67	73	69	65	77	69	69	78	73	70	83	71	73	83	75	76	84	76	73	82	76	75	82	76	72	81	74	67	75	68
10	67	75	70	64	78	74	68	76	70	65	79	70	72	81	71	71	82	73	72	79	74	71	81	75	73	83	73	74	82	76	72	82	76	64	77	72
11	67	76	71	74	79	75	68	76	70	66	78	71	70	78	72	72	81	74	70	82	74	73	81	73	69	85	79	74	82	76	71	80	72	68	78	71
12	66	77	69	66	75	67	70	68	70	67	73	67	70	80	72	73	82	73	72	82	72	72	79	76	73	83	77	72	81	76	69	80	74	68	79	71
13	67	77	71	65	76	66	68	78	72	67	77	71	71	80	70	72	83	75	72	82	73	75	83	73	75	83	78	69	84	76	72	79	75	67	79	75
14	68	77	72	62	75	66	68	76	70	69	77	71	70	79	70	73	81	74	73	80	74	71	81	74	75	85	80	71	84	77	74	80	77	74	79	73
15	70	76	71	58	73	63	70	76	72	68	79	72	65	80	70	72	81	75	72	82	75	73	83	74	75	83	77	72	82	77	74	80	75	71	78	70
16	69	77	71	61	69	64	70	74	72	69	81	69	70	76	71	72	82	75	72	82	75	73	84	73	75	85	77	74	82	77	72	80	75	71	79	71
17	68	77	71	65	75	70	70	77	72	66	79	70	72	77	74	71	82	75	73	83	74	72	83	75	76	86	77	74	82	76	73	80	73	69	79	71
18	69	79	72	66	73	72	68	77	68	66	80	71	72	80	73	71	83	74	73	83	73	68	83	75	72	85	76	71	82	76	73	80	74	72	79	72
19	70	78	72	68	73	65	68	76	69	69	79	71	72	77	72	69	83	75	70	84	74	70	84	71	74	83	78	71	82	74	73	77	74	73	78	71
20	68	76	72	66	77	68	67	75	66	70	79	71	71	77	73	71	83	72	71	83	75	72	84	77	75	84	76	71	81	77	73	80	75	68	79	70
21	70	77	72	66	77	70	67	73	66	67	79	66	71	78	73	67	83	75	73	83	75	70	82	76	74	83	76	73	83	78	73	79	74	65	76	65
22	70	76	71	68	73	70	64	76	70	66	78	71	70	79	72	71	82	71	75	83	75	75	85	77	75	84	78	74	84	78	72	79	74	63	72	75
23	70	77	71	65	76	69	70	77	69	66	79	70	66	81	69	68	84	73	74	83	74	75	83	76	75	84	77	75	87	77	68	79	75	65	75	69
24	69	77	72	69	78	69	68	65	66	67	77	70	70	80	71	73	81	73	74	83	75	75	85	74	75	83	76	71	82	75	69	80	74	67	74	68
25	70	76	72	68	78	68	66	76	71	65	82	71	68	79	72	72	83	74	74	83	75	73	85	77	75	86	73	71	81	75	68	79	74	65	76	67
26	70	79	72	66	74	65	68	77	70	68	82	72	70	81	74	73	82	74	74	83	75	75	83	75	75	83	77	73	81	75	73	80	75	65	78	65
27	69	78	71	58	76	68	68	76	70	67	82	70	70	81	73	70	82	73	72	83	75	72	84	76	75	83	77	73	81	76	72	80	75	63	77	73
28	68	75	70	57	72	68	71	75	72	64	80	70	72	81	74	72	80	73	74	83	75	74	82	75	74	83	77	72	81	76	72	78	74	64	77	72
29	66	73	68				69	76	71	68	81	74	72	80	74	72	81	74	75	83	75	73	86	76	75	80	77	73	81	76	72	78	73	62	77	71
30	65	72	68				70	74	70	67	82	69	72	80	73	70	83	69	74	82	75	74	84	76	75	83	77	74	80	75	72	79	74	65	77	60
31	67	76	68				69	74	69				70	81	74				76	83	77	75	82	76				73	80	76				65	79	70

Observations taken at 50 feet above sea level; maximum, 86; minimum, 57.

INCORPORATED HAWAIIAN SUGAR COMPANIES,

HONOLULU, May 13, 1899.

NAME OF INCORPORATED CO.	Authorized Capital.....	Par Value of Shares...	Number of Shares Authorized.....	Shares sold past Month. †	Highest	Lowest .....
American Sugar Co, ...($750,000 paid up)	$ 1,500,000	$ 100	15,000	92	155	120
Ewa Plantation Co.....	5,000,000	20	250,000	103	400	385
Haiku Sugar Co	500,000	100	5,000	.....	.....	.....
Hawaiian Agricultural Co.....	1,000,000	100	10,000	30	270	275
Hawaiian Sugar Co	2,000,000	100	20,000	100	290	220
Hamoa Plantation Co, ... (not listed)	175,000	100	1,750	.....	.....	.....
Honokaa Sugar Co.....	2,000,000	20	100.000	30	285	283½
Honomu Sugar Co	750,000	100	7,500	10	400	.....
Hawaiian Comm'l & Sugar Co*.....	10,000,000	100	100,000	...	124	.....
Hutchinson Sugar Plantation Co*.....	2,500,000	50	50,000	.....	3	.....
Hakalau Sugar Co*.....	1,000,000	100	10,000	.....	.....	.....
Hana Plantation Co*.....	5,000,000	100	50,000	.....	17½	.....
Kilauea Sugar Co*.....	2,000,000	50	40.000	.....	32½	.....
Kahuku Plantation Co.....	500,000	100	5,000	.....	.....	.....
Kihei Plantation Co, ... ($1,500,000 paid up)	3,000,000	50	60,000	523	17½	.....
Koloa Sugar Co	300,000	100	3,000	.....	.....	15½
Kipahulu Sugar Co.....	160,050	100	1,600	.....	.....	.....
Kona Sugar Co ..... ($180,000 paid up)	500,000	100	5,000	.....	.....	.....
Maunalei Sugar Co, ...($100,000 paid up)	1,000,000	100	10,000	.....	.....	.....
Nahiku Sugar Co.....(New, not listed)	750,000	20	37.500	.....	.....	.....
Oahu Sugar Co.....	2.400,000	100	24,000	471	300	.....
Onomea Sugar Co.....	1,000,000	100	10,000	.....	.....	270
Ookala Sugar Co	500,000	20	25,000	1220	24	22½
Olowalu Sugar Co	150,000	100	1,500	.....	.....	.....
Olaa Sugar Co	5,000,000	20	250,000	.....	.....	.....
Paauhau Plantation Co*.....	5.000,000	50	100,000	895	40	39
Pacific Sugar Mill.....	500,000	100	5,000	.....	.....	.....
Paia Plantation Co	750,000	100	7,500	.....	.....	.....
Pepeekeo Sugar Co	750,000	100	7,500	.....	.....	.....
Pioneer Mill Co.....	2.000.000	100	20,000	75	425	415
Wailuku Sugar Co.....	700,000	100	7,000	104	400	.....
Waianae Sugar Co	300,000	100	3,000	.....	.....	.....
Waialua Agricultural Co...($1,500,000 paid up)	3,500,000	100	35,000	180	182	171
Waimanalo Sugar Co.....	252,000	100	2,520	.....	.....	.....
Waimea Sugar Mill Co	125,000	100	1,250	.....	.....	.....

* Incorporated in California. Sales in San Francisco reported.
† Sales reported from April 20 to May 30.

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Interesting data relating to the Daira syndicate in Egypt have recently been published. During 1898, 78,394 tons of sugar were extracted from 711,680 tons of canes. The extraction was 11 per cent sugar of all grades, of which 10 per cent was first grade, 0.74 per cent second and 0.22 third. There remained only 2.10 per cent residuum molasses. A new method for *bagasse* working has met with considerable success. The same hot water is used many times; it finally contains 7 per cent sugar and the final loss in washing is only 0.15 to 0.20 per cent of the weight of the cane. It has been possible thus far to wash the residuum from a 250-ton factory; on the other hand, some of these establishments grind over 1,000 tons in 24 hours. The total profits for the nine factories under the Daira control is about $370,000. Nearly all the sugar made was sent to the United States; only 9000 tons found their way to England and 4000 tons to India. —Sugar Beet.